

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
24 June 2004 (24.06.2004)

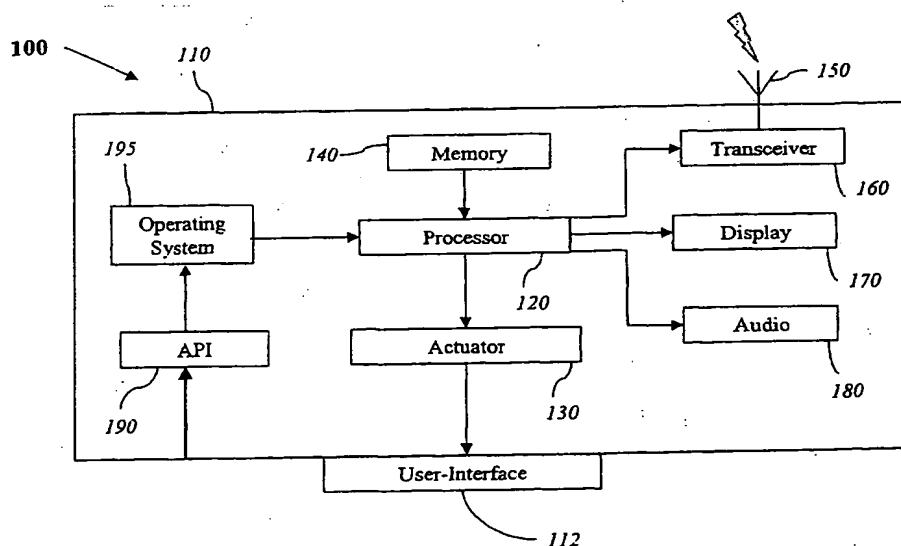
PCT

(10) International Publication Number
WO 2004/053829 A1

- (51) International Patent Classification?: **G09G 5/00**
- (21) International Application Number:
PCT/US2003/038862
- (22) International Filing Date: 8 December 2003 (08.12.2003)
- (25) Filing Language: English
- (26) Publication Language: English
- (30) Priority Data:
60/431,662 8 December 2002 (08.12.2002) US
- (71) Applicant (for all designated States except US): **IMMER-
SION CORPORATION** [US/US]; 801 Fox Lane, San
Jose, CA 95131 (US).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): **GRANT, Danny**
[CA/CA]; 6678 Chateaubriand, Montreal, Québec H2S
2N7 (CA). **EID, Jeffrey** [US/US]; 105 Shadwell Drive,
Danville, CA 94506 (US). **ENDO, Shoichi** [JP/US]; 20268
Northwest Square, Cupertino, CA 95014 (US).
- (74) Agents: **ALEMANNI, John, C. et al.**; Kilpatrick Stock-
ton LLP, 1001 West Fourth St., Winston-Salem, NC 27101
(US).
- (81) Designated States (*national*): AE, AG, AL, AM, AT, AU,
AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU,
CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE,
GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR,
KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK,
MN, MW, MX, MZ, NI, NO, NZ, OM, PG, PH, PL, PT,
RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR,
TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.
- (84) Designated States (*regional*): ARIPO patent (BW, GH,
GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW),
Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE,
ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE,
SI, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA,
GN, GQ, GW, ML, MR, NE, SN, TD, TG).
- Published:
— with international search report

[Continued on next page]

(54) Title: METHODS AND SYSTEMS FOR PROVIDING A VIRTUAL TOUCH HAPTIC EFFECT TO HANDHELD COM-
MUNICATION DEVICES



(57) Abstract: Embodiments of the invention relate to methods and systems (100) for providing customized "haptic messaging" to use of handheld communication devices in a variety of applications. In one embodiment, a method of providing virtual touch to a handheld communication device includes: receiving an input signal associated with a virtual touch; outputting a request relating to a contact with a user-interface member coupled to a handheld communication device; and providing a control signal associated with the contact to an actuator coupled to the handheld communication device, the control signal being configured to cause the actuator to output a haptic effect associated with the virtual touch.

METHODS AND SYSTEMS FOR PROVIDING A VIRTUAL TOUCH HAPTIC EFFECT TO HANDHELD COMMUNICATION DEVICES

INVENTORS

Danny Grant, Shoichi Endo, and Jeffrey Eid

CROSS-REFERENCE TO RELATED APPLICATIONS

This application claims priority to U.S. Provisional Patent Application No. 60/431,662, filed on December 8, 2002, the entire disclosure of which is incorporated herein by reference.

FIELD OF THE INVENTION

This invention relates generally to haptic-feedback systems. More specifically, embodiments of the present invention relate to using customized haptic effects in a variety of applications to convey information to users of handheld communication devices.

BACKGROUND

As handheld communication devices become part of everyday life, device manufactures and service providers strive to enhance the versatility and performance of such devices.

Handheld communication devices in the art (e.g., mobile phones, pagers, personal digital assistants (PDAs), etc.) typically use auditory and visual cues to alert a user when incoming messages, such as voice calls and emails, are received. Such auditory and visual alerts, however, have the disadvantages of being distracting in some situations (e.g., during driving), or annoying in others (e.g., during a meeting or a concert). Although vibratory alerts are made available in some communication devices such as cellular phones, such vibratory effects cannot be customized or personalized according to applications, thus conveying little information to the user. A need, therefore, exists in the art for a new sensory modality that delivers information to users of handheld communication devices in a personalized fashion.

SUMMARY

Embodiments of the invention relate to methods and systems for providing customized "haptic messaging" to users of handheld communication devices in a variety of applications.

In one embodiment, a method of providing virtual touch to a handheld communication device includes: receiving an input signal associated with a virtual touch; outputting a request relating to a contact with a user-interface member coupled to a handheld

communication device; and providing a control signal associated with the contact to an actuator coupled to the handheld communication device, the control signal being configured to cause the actuator to output a haptic effect associated with the virtual touch.

In another embodiment, a method of providing virtual touch to a handheld communication device includes: receiving a virtual touch indicator; performing an initialization responsive to the virtual touch indicator on a handheld communication device; receiving a virtual touch signal associated with the initialization; and outputting a control signal associated with the virtual touch signal to an actuator coupled to the handheld communication device.

Further details and advantages of embodiments of the invention are set forth below.

BRIEF DESCRIPTION OF THE FIGURES

These and other features, aspects, and advantages of the present invention are better understood when the following Detailed Description is read with reference to the accompanying drawings, wherein:

FIG. 1 depicts a block diagram of a haptic handheld communication device according to an embodiment of the present invention;

FIG. 2 shows a flowchart depicting a method of using customized haptic effects to convey information to users of handheld communication devices, according to an embodiment of the invention;

FIG. 3 shows a flowchart depicting a method of using haptic logos to relate information to users of handheld communication devices, according to an embodiment of the invention;

FIG. 4 shows a flowchart depicting a method of haptically encoding communication signals, according to an embodiment of the invention;

FIG. 5 shows a flowchart depicting a method of providing haptic messaging to users of handheld communication devices, according to a further embodiment of the invention;

FIG. 6 shows a flowchart illustrating a method of providing an interactive virtual touch in one embodiment of the present invention;

FIG. 7 depicts a flowchart illustrating a method of carrying out a chat session using handheld communication devices, according to an embodiment of the invention;

FIG. 8 shows a flowchart depicting a method of using haptic effects to relate navigation information, according to an embodiment of the invention; and

FIG. 9 shows a flowchart illustrating a method for providing haptic effects to a remote control in one embodiment of the present invention.

DETAILED DESCRIPTION

Embodiments described in the following description are provided by way of example to illustrate some general principles of the invention, and should not be construed as limiting the scope of the invention in any manner. One skilled in the art would also recognize that various changes and modifications can be made herein, without departing from the principles and scope of the invention.

FIG. 1 depicts a block diagram of a handheld communication device 100 according to an embodiment of the invention. It will be appreciated that various elements are shown in schematic form for illustrative purposes and are not drawn to scale. It will also be appreciated that many alternative ways of practicing the present invention exist. Accordingly, various changes and modifications may be made herein, without departing from the principles and scope of the invention.

Device 100 includes a device body including a housing 110 and a user-interface 112; a processor 120; at least one actuator 130 in communication with processor 120; and a memory 140 in communication with processor 120. Device 100 also includes an antenna 150 and a transceiver 160, in communication with processor 120. Device 100 additionally includes a display module 170 and an audio module 180, in communication with processor 120. Display module 170 may include, for example, a liquid crystal device. Audio means 180 may include, for example, a speaker, a microphone, and the like.

For purpose of illustration in the embodiment of FIG. 1, processor 120, actuator 130, and memory 140 are shown to be enclosed within and coupled to the device body. Such an illustration, however, should not be construed as limiting the scope of the invention in any manner. In alternative embodiments, actuator 130 may, for example, be coupled to the outside of housing 110, or embedded in housing 110 via a suitable mechanism. Further, user-interface 112 may include one or more user-interface members. As used herein, a user-interface member includes, without limitation, a key pad having one or more keys, one or more buttons, a touch screen or touch pad, a scroll wheel, a direction pad, a trackball, a knob, a miniature joystick, or other user-interface means known in the art.

Device 100 further includes an API (Application Program Interface) 190, working in conjunction with an operating system 195. A device driver (not shown) may optionally provide an interface between operating system 195 and processor 120.

Memory 140 of device 100 stores a program code that includes instructions to cause processor 120 to perform various tasks. The following description provides some examples.

FIG. 2 shows a flowchart 200 depicting a method of using customized haptic effects to convey information to users of handheld communication devices, according to an embodiment of the invention. At step 210, an input signal associated with an event is received. At step 220, a source of the event is determined and a control signal is selected based on the determination. At step 230, a control signal is output to an actuator coupled to a handheld communication device (see FIG. 1 for an embodiment of such device). The control signal is configured to cause the actuator to output a haptic effect associated with the event.

Furthermore at step 240, a collection of haptic effects is provided, each haptic effect being associated with a control signal. For example, memory 140 of FIG. 1 can store a program code that includes instructions to generate the control signals (e.g., each characterized by a distinct waveform) for rendering the corresponding haptic effects. Haptic effects (along with associated control signals) may also be downloaded or transmitted from a remote source, such as a service provider, a network resource, a Web server, a remote handheld communication device or computer. Such downloaded or transmitted haptic effects can be further edited or modified. At step 250, a mapping between an event of interest and one of the stored haptic effects is received. By way of example, memory 140 of FIG. 1 may also store a program code that enables a user to map an event of interest to one of the haptic effects as provided, e.g., via user-interface 112 through API 190, where the event may be identified by its source. At step 260, the one-to-one mappings made between various events of interest and the corresponding haptic effects are compiled into a haptic lookup table, which can, for example, be stored in memory 140 of FIG. 1.

In the embodiment of FIG. 2, the term "selecting" includes, without limitation, looking up a predetermined mapping between the event of interest and a corresponding haptic effect based on the source determination, and selecting/generating a control signal that is configured to render the desired haptic effect associated with the event (e.g., upon being applied to an actuator). Selection can be made based upon the aforementioned haptic lookup table, for example.

In one embodiment, the input signal may include a communication signal associated with a call event, such as a voice call, an e-mail, or a message in text or multimedia form, which may be received via antenna 150 and transceiver 160 of FIG. 1, for example. The "source" of a call event may be related to a characteristic that distinctly identifies or

characterizes the call event, such as the caller's phone number, the sender's e-mail address, a graphical feature or an icon associated with the incoming message, etc.

In another embodiment, the input signal may be associated with a reminder event, which may be a self-generated message on the handheld communication device serving as a reminder for a pre-scheduled activity (e.g., an appointment or a meeting). The source in this scenario may be associated with the type of a pre-scheduled activity (e.g., a business meeting vs. a restaurant reservation), or the time at which the pre-scheduled activity takes place.

In yet another embodiment, the input signal may include a communication signal associated with a status event, for example, received via antenna 150 and transceiver 160 of FIG. 1. Examples of a status event include, but are not limited to: an advertisement (e.g., sale) event, a one-to-one marketing event, a business-transaction event, a stock-trading event, a weather-forecast event, a sports (or game) event, an entertainment event, and an emergency (e.g., 911) event. In this scenario, the source may be associated with a characteristic that distinctly identifies the sender and/or the nature of a status event, such as the phone number of the handheld user's stock broker, the e-mail address of the user's favorite store, the logo associated with the user's favorite TV or radio station, and so on.

In one embodiment, an event of interest can be accompanied by a distinct haptic effect, or overlapping haptic effects, conveying to the user customized information such as "who is calling," "what is happening," and so on. The user can also be allowed to update the haptic lookup table, e.g., to include new events, and/or to modify the mappings between the existing events of interest and the corresponding haptic effects.

Moreover, a specific haptic effect can be assigned to any incoming signal event whose source is unknown, so as to alert the user that the incoming message is from an unidentifiable or sender.

As used herein, the term "handheld communication device" includes, without limitation, a mobile phone such as a cellular phone or a satellite phone, a personal digital assistant (PDA), a cordless telephone, a pager, a two-way radio, a handheld or portable computer, a game console controller, a personal gaming device, an MP3 player, or other personal electronic devices known in the art that are equipped with communication or networking capabilities.

In one embodiment, the aforementioned haptic effects can be used as haptic ringers (e.g., counterparts to auditory ring tones) that are customized or personalized to convey information to the user about various events of interest. By way of example, a haptic ringer associated with a call from a loved one (e.g., the user's spouse) may comprise low-amplitude

and high frequency vibrations that impart gentle sensations to the user. In contrast, a haptic ringer associated with an emergency event (such as a 911-call) may comprise jolt-like pulses that impart pounding sensations to the user.

In contrast with conventional auditory ring tones, the aforementioned haptic effects (e.g., haptic ringers) are more desirable in an environment where extraneous auditory signals are prohibited (e.g., during a meeting or a concert), and/or where it is difficult to distinguish auditory signals (e.g., in a loud environment such as an airport). The haptic ringers are also more suitable in distracting situations such as driving, so that the user of a handheld communication device can keep eyes on the road without having to look at the device. Moreover, such haptic ringers convey customized information to the user, so that the user is aware of "who is calling," "what is happening," and so on, as the following examples further illustrate.

A handheld communication device such as a mobile phone may be configured to allow a user to include haptic information or a haptic code in an outgoing communication signal, e.g., carrying a voice call, an e-mail, or a message. The encoding of a communication signal with haptic information may be based on an established scheme or protocol, and/or on a per-system basis. The haptic code is configured to cause a haptic effect to be output when the communication signal is delivered to another handheld communication device. In one embodiment, businesses and organizations may each be associated with a distinct haptic logo (e.g., a particular vibration pattern) and include their haptic logos in various messages sent to the handheld communication devices of their customers. Such haptic logos can serve as counterparts to conventional logos known in the art, for example. Various status events mentioned above may also be transmitted in this manner. By way of example, a merchant may include its haptic logo in various advertisement events and business transaction events to be transmitted to the handheld communication devices of its customers. Stock brokers (or brokerage firms), TV or radio stations, and marketing/advertising agencies may likewise include their haptic logos in various stock-trading events, weather-forecast events, sports events, entertainment events, and one-to-one marketing events to be transmitted to the handheld users.

FIG. 3 shows a flowchart 300 depicting a method of using haptic logos to relate information to users of handheld communication devices, according to an embodiment of the invention. A handheld communication device receives an input signal at step 310, the input signal being associated with a status event. The handheld communication device extracts a haptic code from the input signal at step 320, where the haptic code is associated with a

haptic logo. At step 330, the handheld communication device provides a haptic effect associated with the haptic logo. Step 330 may include providing a control signal to an actuator coupled to the handheld communication device, where the control signal is based at least in part on the haptic code and configured to cause the actuator to output the haptic effect.

In one embodiment, the extracted haptic code may be directly applied to the actuator for rendering the desired haptic effect. In another embodiment, the haptic code may be configured according to a predetermined scheme or protocol that includes, for example, a table of haptic codes (some of which may be associated with one or more haptic logos) versus control signals for rendering the corresponding haptic effects. In this way, a processor in the handheld communication device can look up the corresponding control signal from the table based on the extracted haptic code, and output the selected control signal to the actuator for rendering the desired haptic effect.

In the embodiments of FIG. 2 or 3, the handheld communication device (or the haptic code) may be programmed such that the haptic effect is output immediately, or at a prescribed time after receiving the input signal, as desired in applications. The haptic effects can also be triggered by, or synchronized with, other occurrences.

A handheld communication device may be further configured such that some of its user-interface members (such as those described above) are each associated with a haptic code, e.g., according to a predetermined scheme or protocol. In one embodiment, some of these haptic codes may be associated with haptic effects that emulate expressions or behaviors, such as "laugh," "giggle," "hug," "high-five," "heartbeat," "pet purring," etc. This allows haptic effects to be transmitted and experienced, e.g., in an interactive conversation or a chat session, by pressing or manipulating such members.

By way of example, suppose that user A (termed "Alice" herein) is engaged in a chat session with user B (termed "Bob" herein) via their respective mobile phones. In one embodiment, when Bob tells Alice a joke, Alice can respond by sending a "laugh" sensation to Bob, e.g., by pressing a key on her mobile phone that is assigned with a haptic code corresponding to a laugh sensation. This causes a signal to be transmitted from Alice's phone to Bob's phone, and a corresponding haptic effect to be output to Bob's phone (and thereby experienced by Bob). In alternative embodiments, Alice can include a haptic code in an outgoing message (which may also contain a video image such as a picture taken by her mobile phone, and/or a graphical feature such as an emoticon emulating a smiley face) to be transmitted to Bob, e.g., by pressing the corresponding user-interface member. The haptic

code causes a haptic effect to be output when the message is delivered to a remote device such as Bob's mobile phone. In one embodiment, the haptic effect may be correlated or synchronized with the displaying of a video image contained in the message. In another embodiment, the generation of the haptic effect based on the haptic code may be carried out in a manner similar to that described above with respect to the embodiment of FIG. 3.

FIG. 4 depicts a flowchart 400 illustrating a method of a method of haptically encoding communication signals, according to an embodiment of the invention. At step 410, an input signal associated with an actuation of a user-interface member is received. By way of example, the input signal may be associated with Alice's pressing or manipulating a particular user-interface member. At step 420, a haptic code associated with the actuation is determined. At step 430, the haptic code is included in an output signal, and the output signal is sent to a remote handheld communication device. As described above, the output signal may also include a message, a video image, and/or a graphical feature.

A handheld communication device may also be configured such that a haptic effect, along with a message, is output upon a contact with a user-interface member being made (e.g., by a user or an input device). FIG. 5 depicts a flowchart 500 illustrating a method of haptic message that can be associated with this situation, according to an embodiment of the invention. At step 510 of the flowchart 500, a handheld communication device receives an input signal. At step 520, the handheld communication device outputs a request for a contact with a user-interface member coupled to the handheld communication device. At step 530, the handheld communication device provides a control signal associated with the contact to an actuator coupled to the handheld communication device. The control signal is configured to cause the actuator to output a haptic effect associated with the input signal. Step 520 may include having a visual effect displayed, an auditory effect played, and/or a distinctive haptic ringer output, which requests a contact with the user-interface member being made.

In one embodiment, the input signal in FIG. 5 may include a haptic code, along with a message, a video image, and/or a graphical feature, etc. For example, the haptic code may be configured to cause a "hug" sensation to be output when the video image contained in the input signal is displayed. The input signal may also contain a provision or protocol that specifies that the incoming message along with the corresponding haptic effect is output upon a contact with a particular user-interface member (e.g., the #5 key) being made. Alternatively, the handheld communication device may determine the user-interface member to be contacted, before outputting incoming message along with the corresponding haptic effect.

In another embodiment, the input signal of FIG. 5 may be associated with a "virtual touch," e.g., to mimic a handshake, a "high-five," a pat on the back, a pulse or heartbeat sensation, a pet purring sensation, or other touch sensations associated with human (and/or human-animal) interactions. In one scenario, the input signal at step 510 may include a
5 "virtual touch indicator," based on which the request for a contact with a particular user-interface member is made. The virtual touch indicator may be in the form of a haptic code, a message, or other informative means. The control signal at step 530 may be generated, e.g., based on the virtual touch indicator, a haptic code associated with the user-interface member at play, or other predetermined scheme. The input signal at step 510 may also include a
10 virtual touch indicator along with a virtual touch signal for rendering the desired haptic effect. In this case, the control signal at step 530 may be based on the virtual touch signal.

Referring back to the chat session between Alice and Bob, by way of example at the end of their chat session, Alice may wish to send Bob a "high-five." She sends to Bob's mobile phone a signal including a virtual touch indicator, which in turn prompts a request that
15 Bob be in contact with a user-interface member coupled to his phone, such as a direction pad (e.g., by putting his fingers on the individual keys of the direction pad), a key pad, a touch screen, a trackball, a joystick, or the like. The control signal for rendering a haptic effect that emulates a "high-five" may be based on the haptic code associated with the user-interface member, transmitted with the input signal from Alice, and/or other predetermined scheme.

Interactive virtual touch can also be engaged between users of handheld communication devices, where the manipulation of a user-interface member on one handheld communication device is transmitted possibly in substantially real-time to another handheld device and experienced by its user, and vice versa. FIG. 6 depicts a flowchart 600 illustrating a method of providing interactive virtual touch in one embodiment of the present invention.
20 In the embodiment shown, a handheld communication device first receives an input signal including a virtual touch indicator at step 610. A distinctive haptic ringer may, for example, accompany the arrival of the virtual touch indicator, identifying the sender and the nature of the input signal. The handheld communication device may then perform any necessary initialization to enable the communication at step 620, which may also include requesting a
25 contact with a particular user-interface member coupled to the handheld communication device at step 625. The handheld communication device subsequently receives a virtual touch signal in the communication associated with the desired haptic effect at step 630. The handheld communication device provides the haptic effect at step 640, e.g., by applying the virtual touch signal to an actuator coupled to the user-interface member.
30

In one embodiment, the virtual touch signal may be associated with the manipulation of a user-interface member on a remote handheld device and transmitted in substantially real-time. And the user on the receiving end may respond by acting in a similar fashion, so as to emulate an interactive touch. Any schemes for delivering virtual touch to users of handheld communication devices may be used.

Haptic effects can also be used to enhance and complement the information content communicated between handheld communication devices. In one embodiment, a plurality of handheld communication users may be engaged in a chat session via their handheld communication devices. The users may each have a graphical representation or avatar displayed on other handheld communication devices. Such avatars can also be haptically enabled, for example, whereby their expressions and/or behaviors are accompanied and enhanced by corresponding haptic effects. FIG. 7 is a flowchart 700 depicting a method of carrying out a chat session using handheld communication devices, according to an embodiment of the invention. In the embodiment shown, a handheld communication device receives an input signal associated with a chat message at step 710. The handheld communication device displays an avatar associated with the chat message at step 720. The avatar may be shown on display 170 of FIG. 1, in one embodiment. At step 730, the handheld communication device provides a haptic effect associated with the chat message. Step 730 may include outputting a control signal to an actuator coupled to the handheld communication device, where the control signal is configured to cause the actuator to output the haptic effect. In one embodiment, the haptic effect may be correlated with an expression or behavior of the avatar, such as a laugh or giggle, a cry, a pet purring, or the like.

Handheld communication devices are increasingly equipped with navigation capability, for example, in communication with the Global Position System (GPS) or other navigation systems. Haptic effects can also be used to convey navigation information, such as positional and/or directional information, to handheld users. By way of example, FIG. 8 shows a flowchart 800 depicting a method of haptic navigation, according to an embodiment of the present invention. The flowchart 800 discloses receiving an input signal associated with a position of a handheld communication device at step 810; determining the position of a handheld communication device relative to a predetermined location at step 820; and providing a haptic effect associated with the determination at step 830. Step 830 may include outputting a control signal associated with the determination to an actuator coupled to the handheld communication device, the control signal being configured to cause the actuator to

output the haptic effect. Further, the input signal at step 810 may be received from GPS, a digital compass, or other navigation systems known in the art.

In one embodiment, the haptic effect may be associated with a distance between the position of the handheld communication device and a predetermined location (termed "destination" herein). For example, the haptic effect may include a vibration having a magnitude and a frequency, where at least one of the magnitude and the frequency decreases as the distance from the destination diminishes. Additionally, the haptic effect may be configured to convey a quantitative measure of the distance. By way of example, the haptic effect may include one or more pulse or jolt sensations, where the number of pulses is proportional to the number of miles between the position of the handheld device and the destination.

Processors described above (including processor 120 of FIG. 1) can include, for example, one or more digital logical processors capable of processing input, execute algorithms, and generate output as necessary to perform various tasks, such as those described above. Such processors/controllers may include a microprocessor, an Application Specific Integrated Circuit (ASIC), and state machines. Such processors include, or may be in communication with, media (including memory 140 of FIG. 1). Such media include, for example, computer readable media, which stores program code that, when executed by a processor, cause the processor to perform the steps described herein. Embodiments of computer-readable media include, but are not limited to, an electronic, optical, magnetic, or other storage or transmission device capable of providing a processor, such as the processor in a web server, with computer-readable instructions. Other examples of suitable media include, but are not limited to, a floppy disk, CD-ROM, magnetic disk, memory chip, ROM, RAM, ASIC, configured processor, all optical media, all magnetic tape or other magnetic media, or any other medium from which a computer processor can read. Also, various other forms of computer-readable media may transmit or carry instructions to a computer, including a router, private or public network, or other transmission device or channel.

Program code and associated application programs related to various applications may also reside on a remote source, such as a network resource, a Web server, a remote handheld communication device or computer, which can be transmitted or downloaded to a handheld communication device on a regular or predetermined basis. Haptic effects (along with associated control signals) can also be downloaded or transmitted from a remote source, as described above.

Actuators described above (including actuator 130 shown in FIG. 1) can include, for example, a pager motor, an eccentric rotating motor, a harmonic eccentric rotating motor, a voice coil, a solenoid, a resistive actuator, a piezoelectric actuator, an electro-active polymer actuator, or other types of active/passive actuators suitable for generating haptic effects. U.S. Patent Nos. 6,429,846 and 6,424,333 disclose further details relating to some of these actuators, both of which are incorporated in full herein by reference. In some embodiments, one or more actuators may be implemented in a handheld communication device, configured to deliver appropriate haptic effects. It will be appreciated that various control schemes can be devised accordingly, for controlling the actuator(s) in a manner that best achieves the desired haptic effects.

Referring back to FIG. 1. In one embodiment, actuator 130 may be coupled to housing 110, thereby imparting haptic effects thus generated to the device body. Haptic ringers (or alerts) described above may be delivered in this manner, for instance. In another embodiment, actuator 130 may be coupled to user-interface 112 of the device body. For instance, an active and/or resistive actuator can be coupled to user-interface 112 to deliver a virtual touch described above. One or more actuators can also be coupled to user-interface 112, for example, to convey a virtual touch such to a user. In yet another embodiment, a plurality of actuators can be coupled to housing 110 as well as user-interface 112. In addition, one or more actuators may also be coupled to a headset, a wristband, or other accessory means associated with a handheld communication device.

Embodiments of the invention include the following.

In one embodiment, an individual (or "Bob") can have a mobile phone according to the invention. The mobile phone also has an e-mail capability, for example, including both "receive" and "send"). The mobile phone is configured to provide a plurality of haptic effects, e.g., by including appropriate hardware (such as actuators described above) and program code. Bob can program the mobile phone, for example, via user-interface 112 through API 150 shown in FIG. 1, by inputting various events of interest and associating each with a distinct haptic effect. Thus, when an event of interest is subsequently received, the mobile phone provides the corresponding haptic effect.

In one embodiment, Bob's phone includes programming that provides a first haptic effect when an input signal is received from the mobile phone of Bob's wife (or "Alice"). Bob's phone also includes programming that provides a second haptic effect that is different and distinct from the first haptic effect, when an input signal is received from the mobile phone of Bob's supervisor at work (termed "Carol" herein). Bob's phone is further be

configured to provide a third haptic effect that is different from the two mentioned above, e.g., when an e-mail is received from the e-mail address of Bob's stock broker (where the e-mail contains a "smiley-face" emoticon, for instance). The third haptic effect can be a vibration with high magnitude and short duration, e.g., to emulate a "high-five."

5 In another embodiment, Bob can be watching a movie in a theater with his mobile phone in his pocket. It is set to make no noise, because Bob is in a theater. While Bob is watching the movie, Bob's mobile phone vibrates with the second haptic effect mentioned above. Bob chooses to ignore the call, because he does not wish to speak with his supervisor at a movie theater. Later, Bob's mobile phone vibrates with the first haptic effect. Bob wants
10 to speak with Alice, for example, to make plans to meet later. So Bob answers the phone and quickly exits the theater to talk with Alice.

Bob's mobile phone can also include a personal schedule/calendar application. After speaking with Alice, Bob can enter an entry in the calendar at the 7:00PM time mark -- "Meet Alice". Bob can also choose a fourth haptic effect to associate with the calendar entry. The
15 mobile phone can be programmed to output the fourth haptic effect fifteen minutes before the time entry of the calendar (i.e., at 6:45PM).

Bob's mobile phone can be equipped with GPS capability, along with an associated application program for location determination. Bob can also store addresses of various locations of interest in the application program. In one embodiment, Bob can be on the road.
20 Bob's mobile phone vibrates with a distinct fifth haptic effect. Bob recognizes the fifth haptic effect being associated with the haptic logo of his favorite electronics store. He then checks with the application program, and receives a sixth haptic effect associated with the distance between his current position and the store location. Bob then decides to make a stop at the store.

25 A haptically-enabled handheld communication device of the invention may be further used as a two-way haptic remote control, for example, for controlling a remote system such as a Television set or a multimedia system. In one embodiment, the events as referred to above may be related to program channels shown on the remote system, each identified by a channel number (which may be used as the "source"), for instance. The corresponding haptic
30 effects may be customized on a per-channel basis. Such haptic effects can serve to inform a user as to which channel is on, as a user is channel-surfing by way of this haptic remote control, so that the user need not to look up the display screen.

FIG. 9 depicts a flowchart illustrating a method for providing haptic effects to a remote control in one embodiment of the present invention. In the embodiment shown, the

remote control sends a command signal to a remote system at step 910. As with a conventional remote control, the signal may or may not reach the television. The remote control then determines whether a feedback signal has been received at step 920. If the remote control receives a feedback signal, the remote control provides a first haptic effect at step 930. If not, the remote control provides a second haptic effect at step 940.

The first haptic effect can be further customized according to the received feedback signal. In one embodiment, the remote system provides information (e.g., via the feedback signal) to the remote control regarding the state of the display, e.g., based on a predetermined scheme. The remote control may use the information to determine a corresponding haptic effect to provide at step 930. In alternative embodiments, the remote system may determine the appropriate haptic effect to provide and include a corresponding haptic code in the feedback signal. The remote control provides the haptic effect at step 930 based on this haptic code.

The foregoing description of the preferred embodiments of the invention has been presented only for the purpose of illustration and description and is not intended to be exhaustive or to limit the invention to the precise forms disclosed. Numerous modifications and adaptations thereof will be apparent to those skilled in the art without departing from the spirit and scope of the present invention.

That which is claimed is:

1. A method, comprising:

receiving an input signal associated with a virtual touch;

outputting a request relating to a contact with a user-interface member coupled to a handheld communication device; and

providing a control signal associated with the contact to an actuator coupled to the handheld communication device, the control signal configured to cause the actuator to output a haptic effect associated with the virtual touch.

2. The method of claim 1 further comprising extracting a haptic code from the input signal, the control signal being based at least in part on the haptic code.

3. The method of claim 1 wherein the user-interface member includes one of a key, a button, a key pad, a direction pad, a touch screen, a scroll wheel, a mini-joystick, a trackball, and a knob.

4. The method of claim 1 wherein the virtual touch is associated with one of a handshake, a high-five, a pat on the back, a pulse sensation, a heartbeat sensation, and a pet purring sensation.

5. A method, comprising:

receiving a virtual touch indicator;

performing an initialization responsive to the virtual touch indicator on a handheld communication device;

receiving a virtual touch signal associated with the initialization; and

outputting a control signal associated with the virtual touch signal to an actuator coupled to the handheld communication device.

6. The method of claim 5 wherein the actuator is configured to output a haptic effect to a user-interface member coupled to the handheld communication device.

7. The method of claim 6 wherein the user-interface member includes one of a key, a button, a key pad, a direction pad, a touch screen, a scroll wheel, a mini-joystick, a trackball, and a knob.

8. The method of claim 5 wherein the initialization includes outputting a request relating to a contact with the user-interface member.

9. The method of claim 5 wherein the virtual touch signal is associated with a manipulation of a remote user-interface member.

10. A computer-readable medium on which is encoded program code, comprising:
program code for receiving an input signal associated with a virtual touch;

program code for outputting a request relating to a contact with a user-interface member coupled to a handheld communication device; and

program code for providing a control signal associated with the contact to an actuator coupled to the handheld communication device, the control signal configured to cause the actuator to output a haptic effect associated with virtual touch.

11. The computer-readable medium of claim 10 further comprising extracting a haptic code from the input signal, the control signal being based at least in part on the haptic code.

12. The computer-readable medium of claim 10 wherein the virtual touch is associated with one of a handshake, a high-five, a pat on the back, a pulse sensation, a heartbeat sensation, and a pet purring sensation..

13. A computer-readable medium on which is encoded program code, comprising:
program code for receiving a virtual touch indicator;
program code for performing an initialization responsive to the virtual touch indicator on a handheld communication device;

program code for receiving a virtual touch signal associated with the initialization;
and

program code for outputting a control signal associated with the virtual touch signal to an actuator.

14. The computer-readable medium of claim 13 wherein the actuator is configured to output a haptic effect to a user-interface member coupled to the handheld communication device.

15. The computer-readable medium of claim 14 wherein the user-interface member includes one of a key, a button, a key pad, a direction pad, a touch screen, a scroll wheel, a mini-joystick, a trackball, and a knob.

16. The computer-readable medium of claim 13 wherein the initialization includes outputting a request relating to a contact with the user-interface member.

17. A data stream embodied in a carrier signal, carrying instructions to:
receive an input signal associated with a virtual touch;
output a request relating to a contact with a user-interface member coupled to a handheld communication device; and

provide a control signal associated with the contact to an actuator coupled to the handheld communication device, the control signal configured to cause the actuator to output a haptic effect associated with the virtual touch.

18. A data stream embodied in a carrier signal, carrying instructions to:
receive a virtual touch indicator;
perform an initialization responsive to the virtual touch indicator on a handheld
communication device;

5 receive a virtual touch signal associated with the initialization; and
output a control signal associated with the virtual touch signal to an actuator coupled
to the handheld communication device.

19. The apparatus, comprising:
a user-interface member coupled to a body;
10 a processor;
an actuator coupled to the body and in communication with the processor; and
a memory in communication with the processor, the memory storing program code
executable by the processor, including:

program code for receiving an input signal associated with a virtual touch;
15 program code for outputting a request relating to a contact with the user-
interface member; and
program code for providing a control signal associated with the contact to the
actuator, the control signal configured to cause the actuator to output a haptic effect
associated with the virtual touch.

20 20. The apparatus of claim 19 wherein the body is included in a handheld communication
device.

21. The apparatus of claim 20 wherein the handheld communication device includes one
of a cellular phone, a satellite phone, a cordless phone, a personal digital assistant, a pager, a
two-way radio, a portable computer, a game console controller, a personal gaming device,
25 and an MP3 player.

22. The apparatus of claim 20 wherein the user-interface member includes at least one of
a key, a button, a key pad, a direction pad, a touch screen, a scroll wheel, a mini-joystick, a
trackball, and a knob.

23. The apparatus of claim 19 wherein the virtual touch is associated with one of a
handshake, a high-five, a pat on the back, a pulse sensation, a heartbeat sensation, and a pet
30 purring sensation.

24. The apparatus, comprising:
a user-interface member;
a processor;

an actuator coupled to the a user-interface member and in communication with the processor; and

a memory in communication with the processor, the memory storing program code executable by the processor, including:

5 program code for receiving a virtual touch indicator;

 program code for performing an initialization responsive to the virtual touch indicator;

 program code for receiving a virtual touch signal associated with the initialization; and

10 program code for outputting a control signal associated with the virtual touch signal to the actuator.

25. The apparatus of claim 24 wherein the user-interface member is coupled to a handheld communication device.

26. The apparatus of claim 25 wherein the handheld communication device includes one
15 of a cellular phone, a satellite phone, a cordless phone, a personal digital assistant, a pager, a two-way radio, a portable computer, a game console controller, a personal gaming device, and an MP3 player.

27. The apparatus of claim 24 wherein the user-interface member includes at least one of
20 a key, a button, a key pad, a direction pad, a touch screen, a scroll wheel, a mini-joystick, a trackball, and a knob.

28. The apparatus of claim 24 wherein the virtual touch signal is associated with a manipulation of a remote user-interface member.

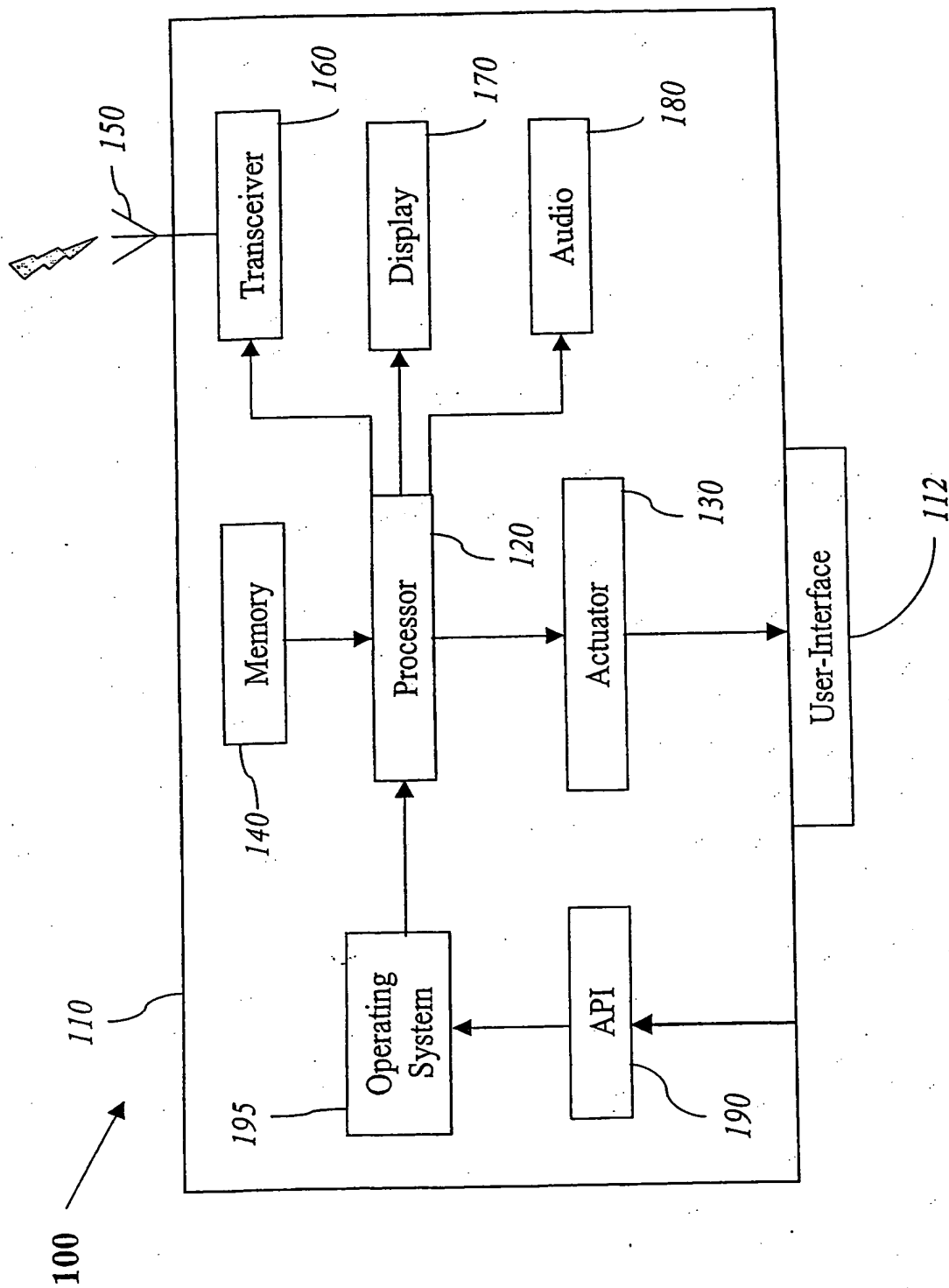


FIG. 1

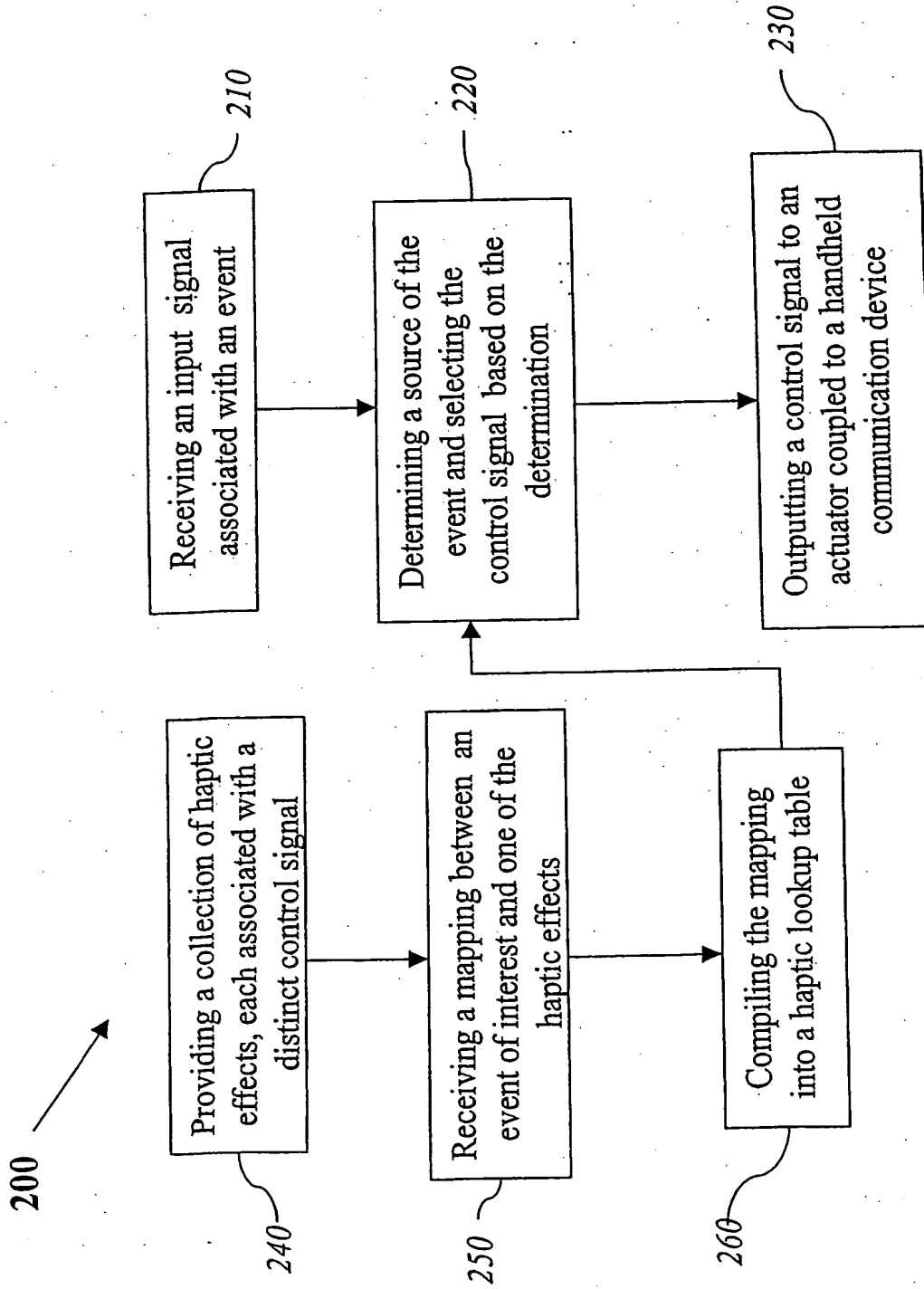


FIG.2

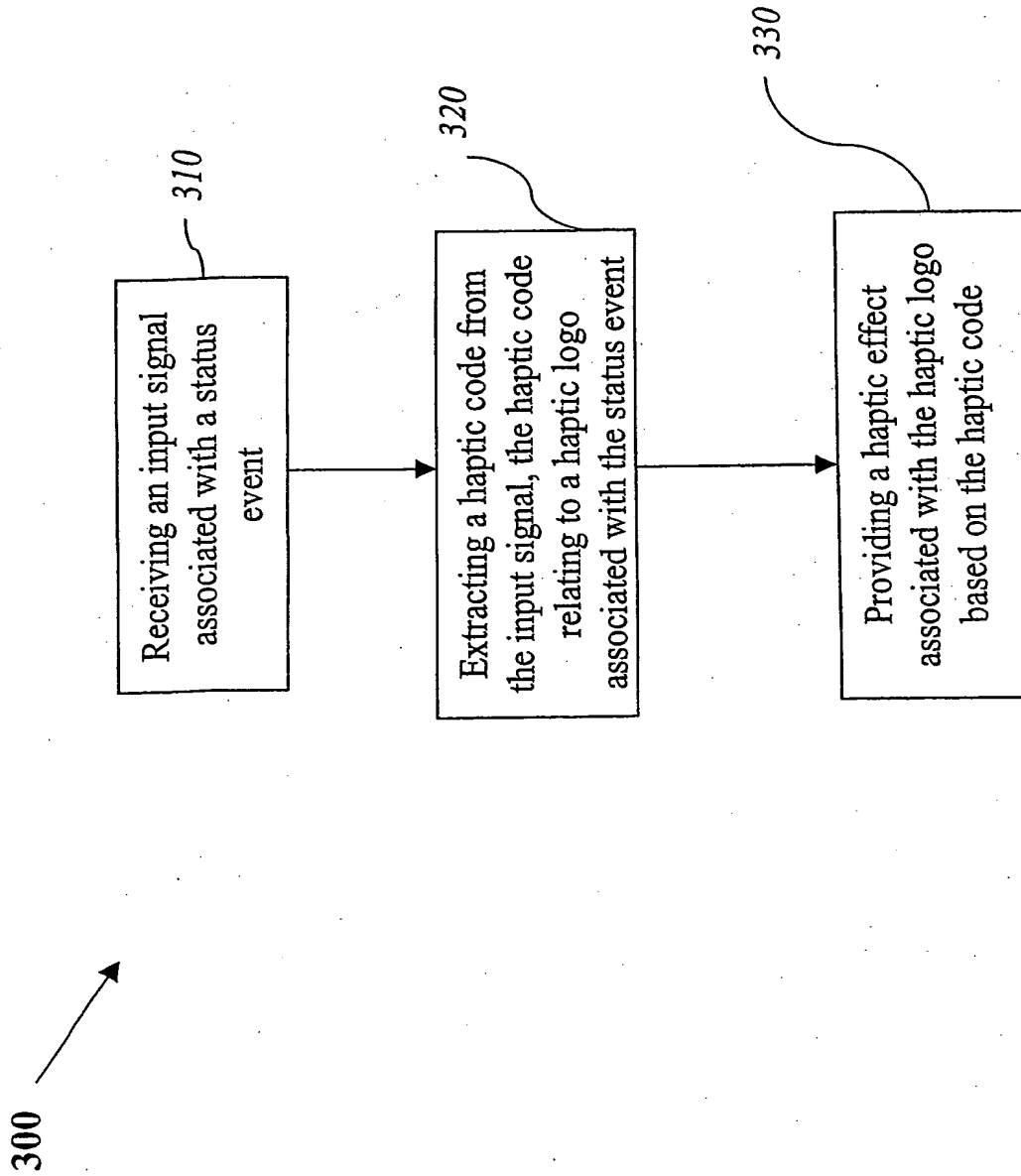


FIG. 3

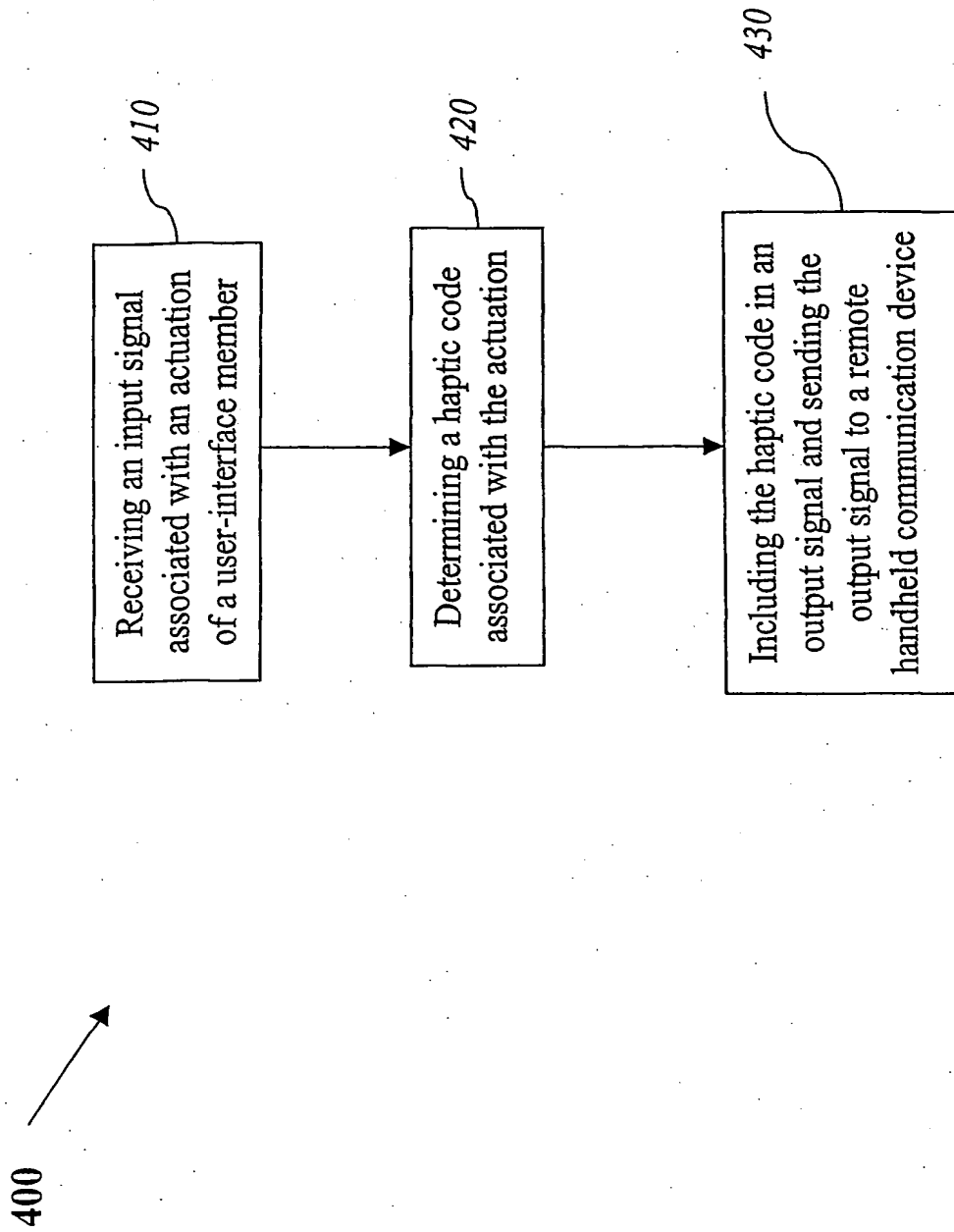


FIG. 4

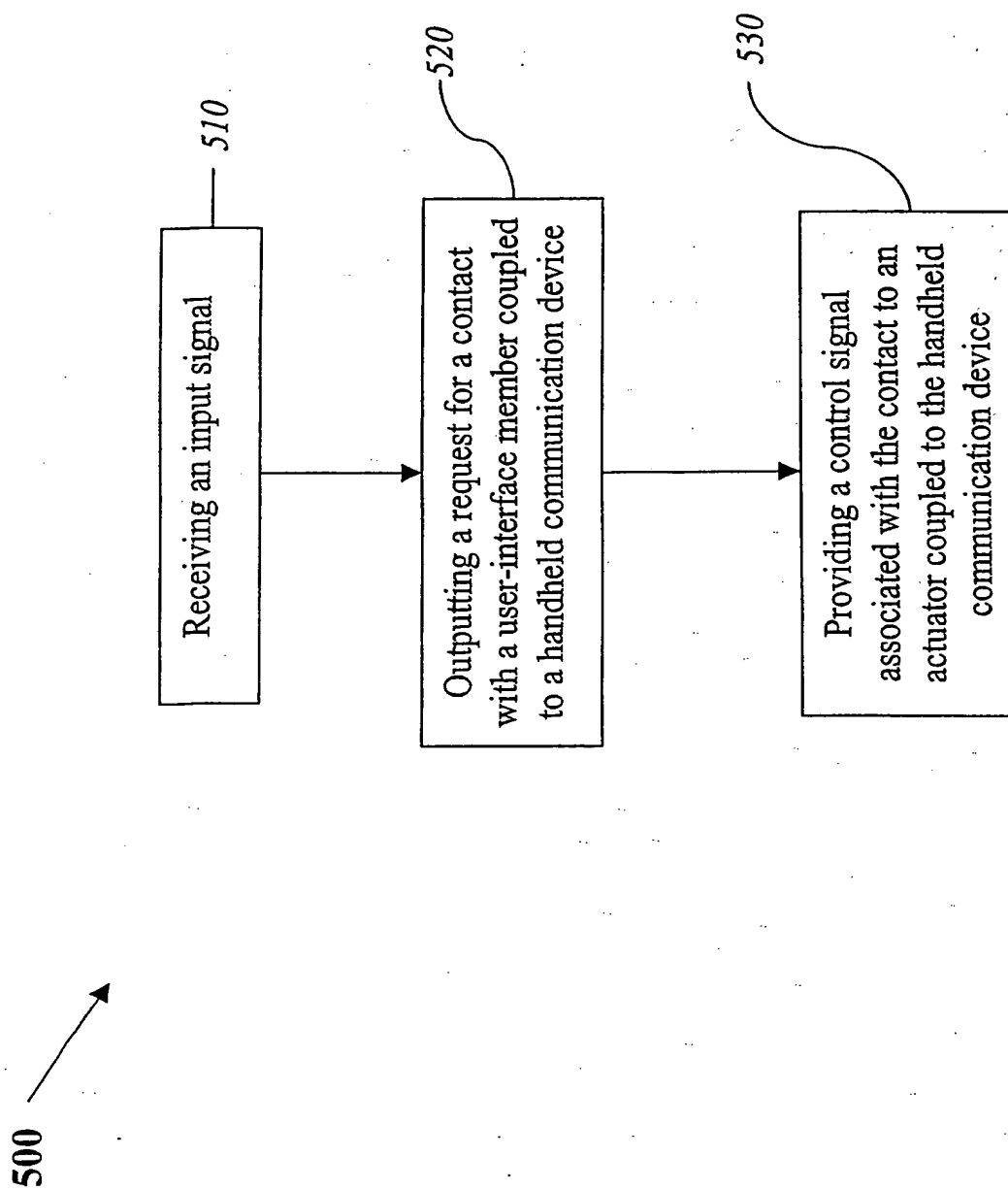


FIG. 5

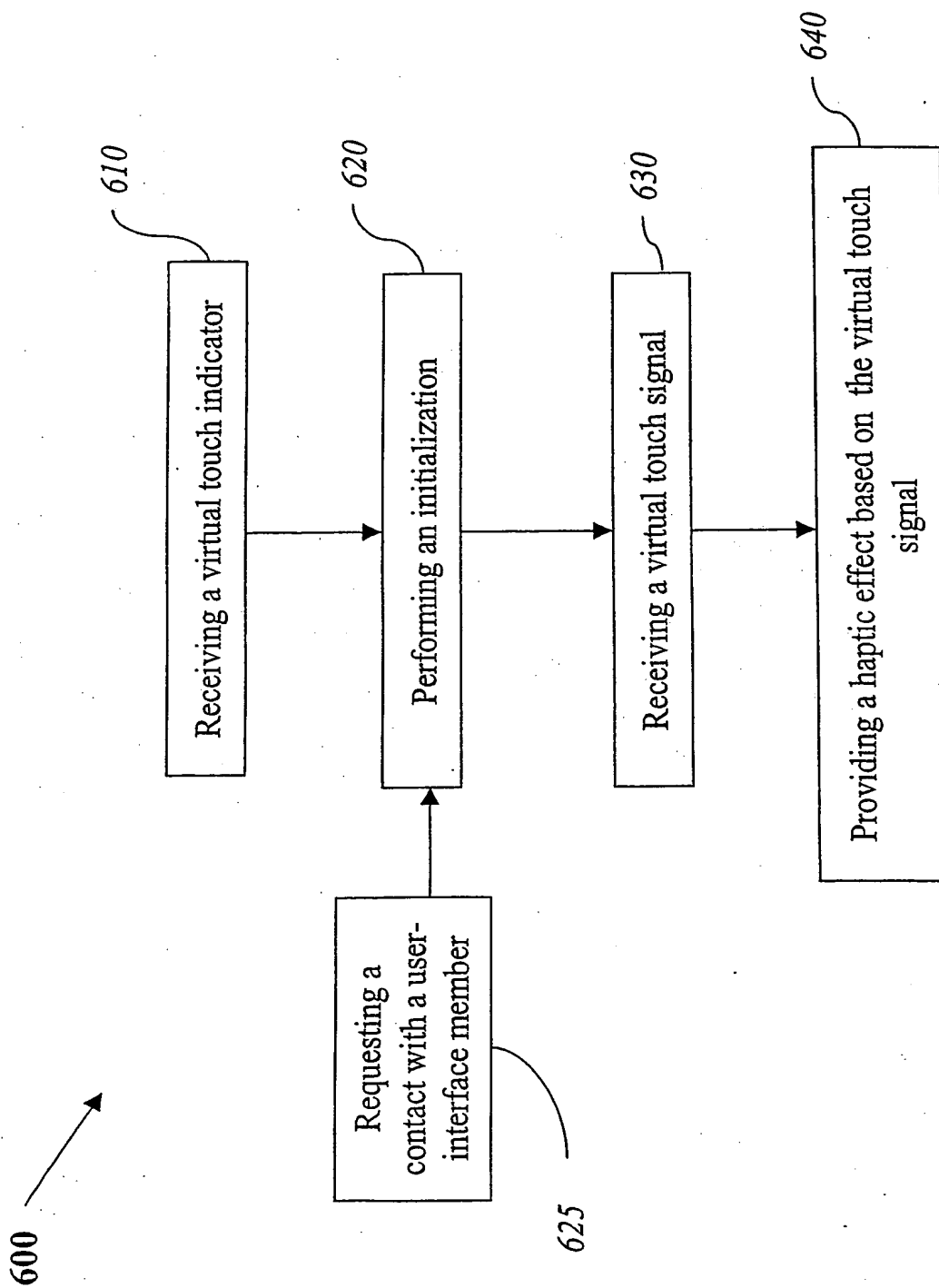


FIG. 6

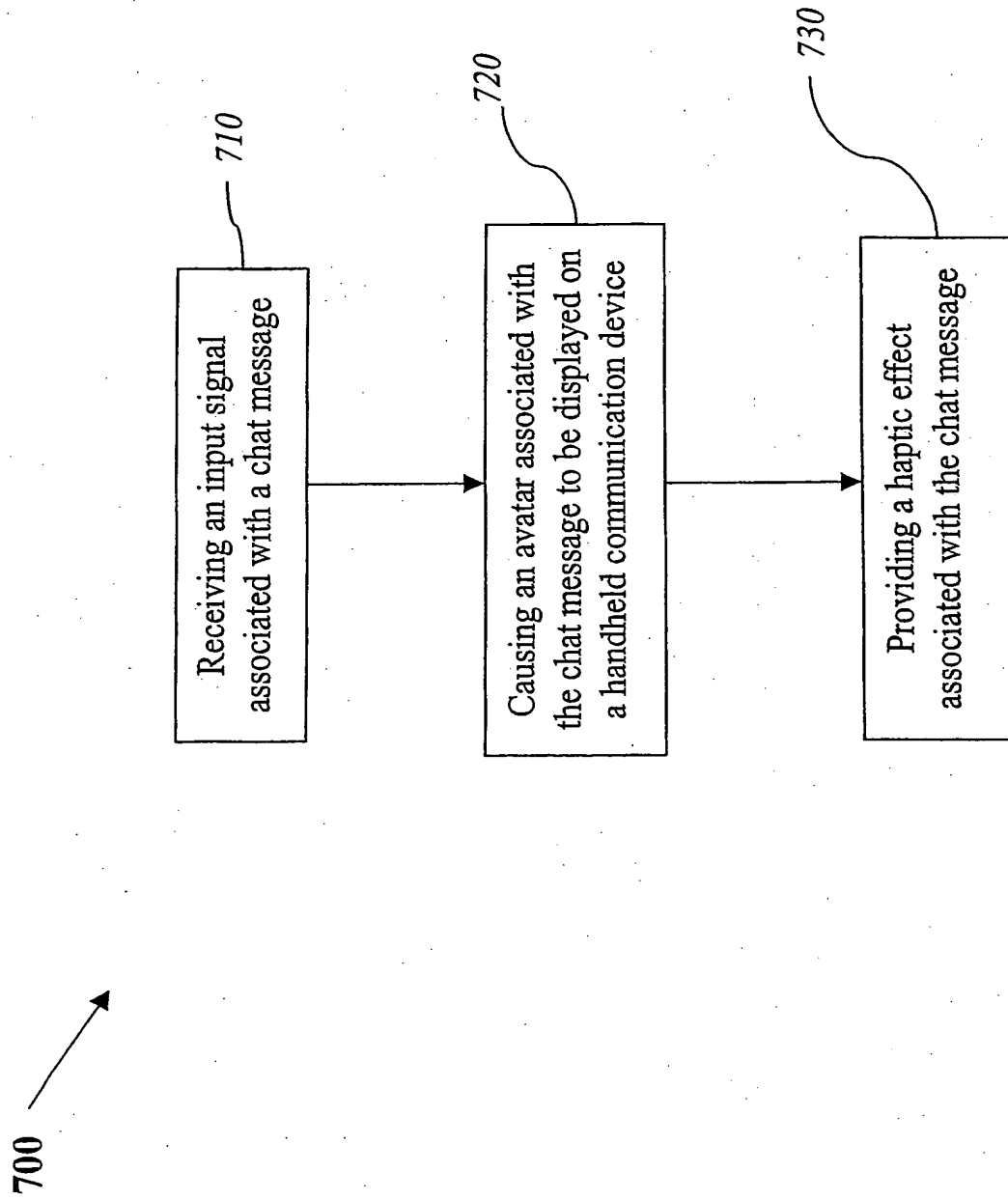


FIG. 7

800

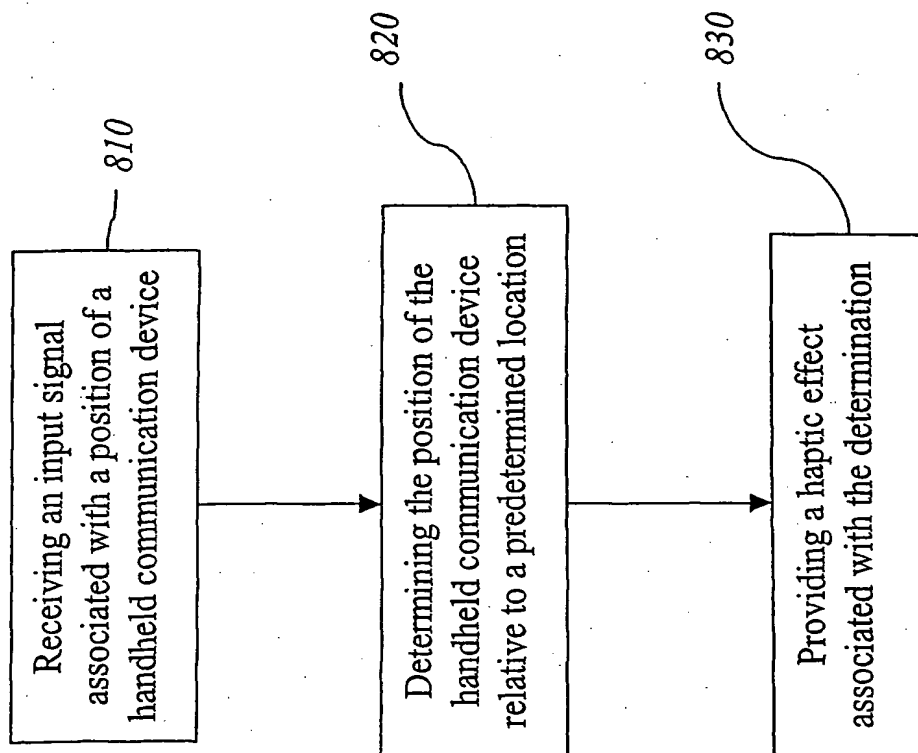


FIG. 8

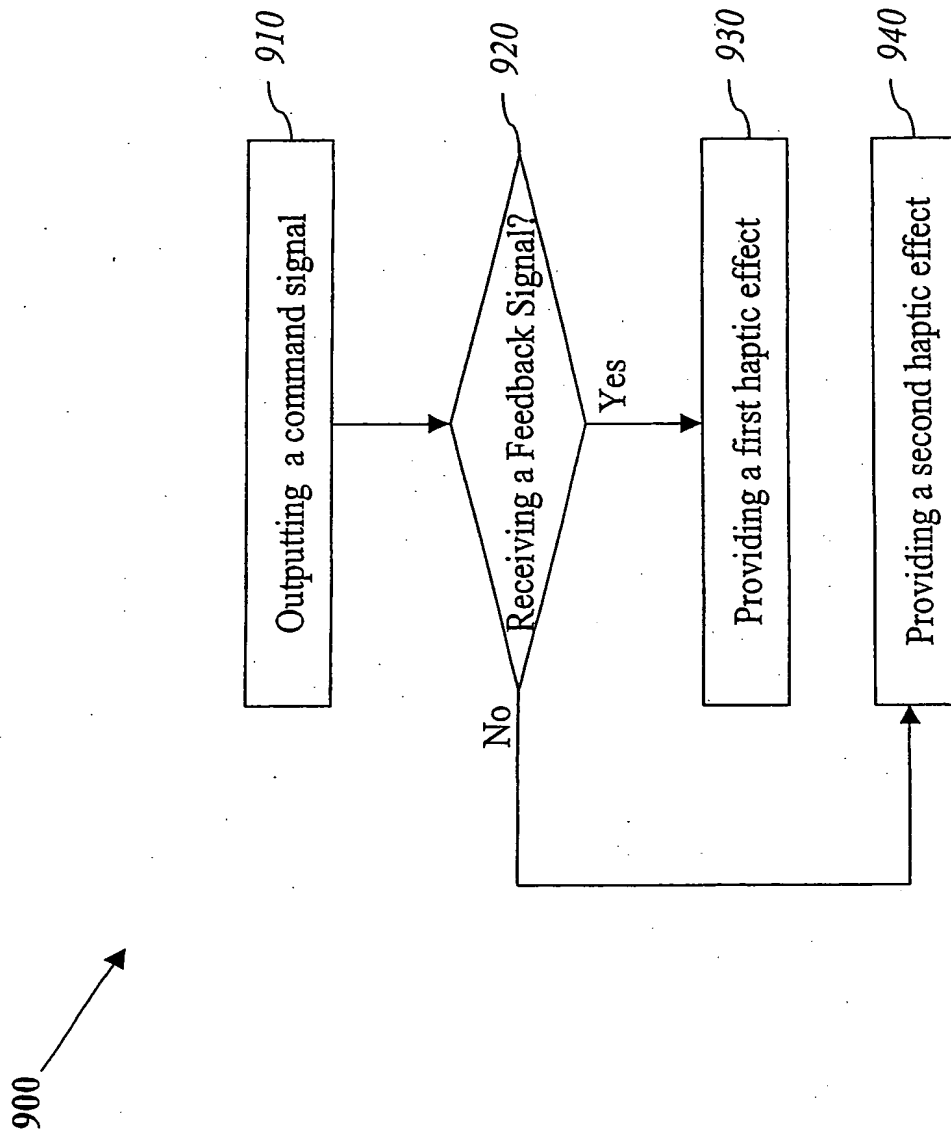


FIG. 9

PCT

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

To:

ALEMANNI, John, G.
Kilpatrick Stockton LLP
1001 West Fourth St.
Winston-Salem, NC 27101
ETATS-UNIS D'AMERIQUE

JUN 30 2004

IMPORTANT NOTICE

Date of mailing (day/month/year)
24 June 2004 (24.06.2004)

Applicant's or agent's file reference
IMM152D.PCT

International application No.
PCT/US2003/038862

International filing date (day/month/year)
08 December 2003 (08.12.2003)

Priority date (day/month/year)
08 December 2002 (08.12.2002)

Applicant

IMMERSION CORPORATION et al

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this notice:

AU, AZ, BY, CH, CN, CO, DZ, EP, HU, JP, KG, KP, KR, MD, MK, MZ, RU, TM, US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:

AE, AG, AL, AM, AP, AT, BA, BB, BG, BR, BZ, CA, CR, CU, CZ, DE, DK, DM, EA, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, ID, IL, IN, IS, KE, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MG, MN, MW, MX, NI, NO, NZ, OA, OM, PG, PH, PL, PT, RO, SC, SD, SE, SG, SK, SL, SY, TJ, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM, ZW

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this notice is a copy of the international application as published by the International Bureau on 24 June 2004 (24.06.2004) under No. WO 2004/053829

4. **TIME LIMITS for filing a demand for international preliminary examination and for entry into the national phase**

The applicable time limit for entering the national phase will, subject to what is said in the following paragraph, be **30 MONTHS** from the priority date, not only in respect of any elected Office if a demand for international preliminary examination is filed before the expiration of 19 months from the priority date, but also in respect of any designated Office, in the absence of filing of such demand, where Article 22(1) as modified with effect from 1 April 2002 applies in respect of that designated Office. For further details, see *PCT Gazette* No. 44/2001 of 1 November 2001, pages 19926, 19932 and 19934, as well as the *PCT Newsletter*, October and November 2001 and February 2002 issues.

In practice, time limits other than the 30-month time limit will continue to apply, for various periods of time, in respect of certain designated or elected Offices. For regular updates on the applicable time limits (20, 21, 30 or 31 months, or other time limit), Office by Office, refer to the *PCT Gazette*, the *PCT Newsletter* and the *PCT Applicant's Guide*, Volume II, National Chapters, all available from WIPO's Internet site, at <http://www.wipo.int/pct/en/index.html>.

For filing a demand for international preliminary examination, see the *PCT Applicant's Guide*, Volume II, Chapter IX. Only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination (at present, all PCT Contracting States are bound by Chapter II).

It is the applicant's sole responsibility to monitor all these time limits.

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Authorized officer

Dorothee Mülhausen

From the INTERNATIONAL SEARCHING AUTHORITY

To:
JOHN C. ALEMANNI
KILPATRICK STOCKTON LLP
1001 WEST FOURTH ST.
WINSTON-SALEM, NC 27101

RECEIVED
APR 14 2004

PCT

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT
OR THE DECLARATION

(PCT Rule 44.1)

Applicant's or agent's file reference
IMM152D.PCT

KILPATRICK STOCKTON, LLP

Date of Mailing
(day/month/year)

FOR FURTHER ACTION See paragraphs 1 and 4 below

International application No.
PCT/US03/38862

International filing date
(day/month/year)

08 December 2003 (08.12.2003)

Applicant
IMMERSSION CORPORATION

1. ☒ The applicant is hereby notified that the international search report has been established and is transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

Where? Directly to the International Bureau of WIPO, 34, chemin des Colombettes
1211 Geneva 20, Switzerland, Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

- ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.
☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. **Reminders**

Shortly after 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90 bis.1 and 90 bis.3, respectively, before the completion of the technical preparations for international publication.

Within 19 months from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later); otherwise the applicant must, within 20 months from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of 30 months (or later) will apply even if no demand is filed within 19 months.

See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the *PCT Applicant's Guide*, Volume II, National Chapters and the WIPO Internet site.

Name and mailing address of the ISA/US
Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450
Facsimile No. (703)305-3230

Authorized officer

Prabodh Dharja

Telephone No. 703-605-1231

Form PCT/ISA/220 (April 2002)

(See notes on accompanying sheet)

From the INTERNATIONAL SEARCHING AUTHORITY

To:
JOHN C. ALEMANNI
KILPATRICK STOCKTON LLP
1001 WEST FOURTH ST.
WINSTON-SALEM, NC 27101

PCT

**NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT
OR THE DECLARATION**

(PCT Rule 44.1)

Date of Mailing (day/month/year) 12 APR 2004	
Applicant's or agent's file reference IMM152D.PCT	FOR FURTHER ACTION See paragraphs 1 and 4 below
International application No. PCT/US03/38862	International filing date (day/month/year) 08 December 2003 (08.12.2003)
Applicant IMMERSION CORPORATION	

1. ☒ The applicant is hereby notified that the international search report has been established and is transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the international application (see Rule 46):

When? The time limit for filing such amendments is normally two months from the date of transmittal of the international search report.

Where? Directly to the International Bureau of WIPO, 34, chemin des Colombettes
1211 Geneva 20, Switzerland, Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect is transmitted herewith.

3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.

☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

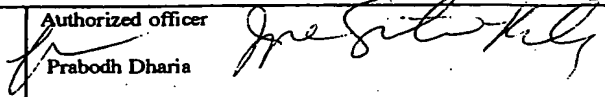
4. Reminders

Shortly after 18 months from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90 *bis*.1 and 90 *bis*.3, respectively, before the completion of the technical preparations for international publication.

Within 19 months from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until 30 months from the priority date (in some Offices even later); otherwise the applicant must, within 20 months from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of 30 months (or later) will apply even if no demand is filed within 19 months.

See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the *PCT Applicant's Guide*, Volume II, National Chapters and the WIPO Internet site.

Name and mailing address of the ISA/US Mail Stop PCT, Attn: ISA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703)305-3230	Authorized officer  Prabodh Dharia Telephone No. 703-605-1231
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Form PCT/ISA/220 (April 2002)

(See notes on accompanying sheet)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference IMM152D.PCT	FOR FURTHER ACTION	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. PCT/US03/38862	International filing date (<i>day/month/year</i>) 08 December 2003 (08.12.2003)	(Earliest) Priority Date (<i>day/month/year</i>) 08 December 2002 (08.12.2002)
Applicant IMMERSSION CORPORATION		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the Report

a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing:

☐ contained in the international application in written form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (See Box II).

4. With regard to the title,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No. 1

☒ as suggested by the applicant.

☐ because the applicant failed to suggest a figure.

☐ because this figure better characterizes the invention.

☐ None of the figures

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/38862

Box III TEXT OF THE ABSTRACT (Continuation of Item 5 of the first sheet)

Embodiments of the invention relate to methods and systems (100 of figure 1) for providing customized "haptic messaging" to use of handheld communication devices in a variety of applications. In one embodiment, a method of providing virtual touch to a handheld communication device includes: receiving an input signal associated with a virtual touch; outputting a request relating to a contact with a user-interface member coupled to a handheld communication device; and providing a control signal associated with the contact to an actuator coupled to the handheld communication device, the control signal being configured to cause the actuator to output a haptic effect associated with the virtual touch.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/38862

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G09G 5/00

US Cl. : 345/156

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 345/156, 157, 163, 169, 173, 179, 184; 441/5, 730; 340/825, 46, 825.19; 709/203, 217

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
y	US 6,429,846 B2 (Rosenberg et al.) 06 August 2002 (06.08.2002) Col. 1, lines 23-67, Col.2, Lines 6-53, Col. 3, Lines 39-62, Col. 4, Lines 65-67, Col. 5, Lines 32-55, Col. 6, Lines 7-49, 55-67, Col. 8, Lines 61-67, Col. 11, Lines 24-39, Col. 13, Lines 22-40, 27-41, Col. 14, Lines 54-67, Col. 15, lines 45-52, Col. 16, lines 8-34, Col. 17, Lines 1-13, 18-67, Col. 18, Lines 10-67, Col. 20, Lines 1-18, 23-27	1-28
Y	US 6,337,678 B1 (Fish) 08 January 2002 (08.01.2002) Col. 17, Lines 43-63	1-28
y	US 6,219,032 B1 (Rosenberg et al.) 17 April 2001 (17.04.2001) Col. 7, Lines 1-66, Col. 8, Lines 1-67, Col. 19, Line 59 to Col. 20, Line 16	1-28
y	US 6,435,794 B1 (Springer) 20 August 2002 (20.08.2002) Col. 10, Lines 20-67	1-28

☐ Further documents are listed in the continuation of Box C.



See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"

document member of the same patent family

Date of the actual completion of the international search

25 March 2004 (25.03.2004)

Date of mailing of the international search report

12 APR 2004

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Facsimile No. (703)305-3230

Authorized officer

Prabodh Dharja

Telephone No. 703-605-1231

— before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/38862

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7) : G09G 5/00

US CL : 345/156

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 345/156,157,163,169,173,179,184; 441/5,730; 340/825,46,825.19; 709/203,217

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
y	US 6,429,846 B2 (Rosenberg et al.) 06 August 2002 (06.08.2002) Col. 1, lines 23-67, Col.2, Lines 6-53, Col. 3, Lines 39-62, Col. 4, Lines 65-67, Col. 5, Lines 32-55, Col. 6, Lines 7-49, 55-67, Col. 8, Lines 61-67, Col. 11, Lines 24-39, Col. 13, Lines 22-40, 27-41, Col. 14, Lines 54-67, Col. 15, lines 45-52, Col. 16, lines 8-34, Col. 17, Lines 1-13, 18-67, Col. 18, Lines 10-67, Col. 20, Lines 1-18, 23-27	1-28
Y	US 6,337,678 B1 (Fish) 08 January 2002 (08.01.2002) Col. 17, Lines 43-63	1-28
y	US 6,219,032 B1 (Rosenberg et al.) 17 April 2001 (17.04.2001) Col. 7, Lines 1-66, Col. 8, Lines 1-67, Col. 19, Line 59 to Col. 20, Line16	1-28
y	US 6,435,794 B1 (Springer) 20 August 2002 (20.08.2002) Col. 10, Lines 20-67	1-28

☐ Further documents are listed in the continuation of Box C.

☐ See patent family annex.

* Special categories of cited documents:	"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"A" document defining the general state of the art which is not considered to be of particular relevance	"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"E" earlier application or patent published on or after the international filing date	"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"&" document member of the same patent family
"O" document referring to an oral disclosure, use, exhibition or other means	
"P" document published prior to the international filing date but later than the priority date claimed	

Date of the actual completion of the international search

25 March 2004 (25.03.2004)

Date of mailing of the international search report

12 APR 2004

Name and mailing address of the ISA/US

Mail Stop PCT, Attn: ISA/US
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

Facsimile No. (703)305-3230

Authorized officer

Prabodh Dharia

Telephone No. 703-605-1231

NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under Article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the *PCT Applicant's Guide*, a publication of WIPO.

In these Notes, "Article," "Rule" and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions, respectively.

INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only.

What parts of the international application may be amended ?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Preliminary Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

When ? Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

Where not to file the amendments ?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

How ? Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

What documents must/may accompany the amendments ?

Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.

PCT

NOTIFICATION CONCERNING
SUBMISSION OR TRANSMITTAL
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

From the INTERNATIONAL BUREAU

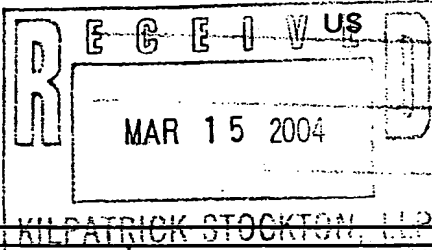
To:

ALEMANNI, John, C.
Kilpatrick Stockton LLP
1001 West Fourth St.
Winston-Salem, NC 27101
United States of America

Date of mailing (day/month/year) 04 March 2004 (04.03.2004)	
Applicant's or agent's file reference IMM152D.PCT	IMPORTANT NOTIFICATION
International application No. PCT/US2003/038862	International filing date (day/month/year) 08 December 2003 (08.12.2003)
International publication date (day/month/year) Not yet published	Priority date (day/month/year) 08 December 2002 (08.12.2002)
Applicant IMMERSION CORPORATION et al	

1. By means of this Form, which replaces any previously issued notification concerning submission or transmittal of priority documents, the applicant is hereby notified of the date of receipt by the International Bureau of the priority document(s) relating to all earlier application(s) whose priority is claimed. Unless otherwise indicated by the letters "NR", in the right-hand column or by an asterisk appearing next to a date of receipt, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
2. (If applicable) The letters "NR" appearing in the right-hand column denote a priority document which, on the date of mailing of this Form, had not yet been received by the International Bureau under Rule 17.1(a) or (b). Where, under Rule 17.1(a), the priority document must be submitted by the applicant to the receiving Office or the International Bureau, but the applicant fails to submit the priority document within the applicable time limit under that Rule, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
3. (If applicable) An asterisk(*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b) (the priority document was received after the time limit prescribed in Rule 17.1(a) or the request to prepare and transmit the priority document was submitted to the receiving Office after the applicable time limit under Rule 17.1(b)). Even though the priority document was not furnished in compliance with Rule 17.1(a) or (b), the International Bureau will nevertheless transmit a copy of the document to the designated Offices, for their consideration. In case such a copy is not accepted by the designated Office as priority document, Rule 17.1(c) provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
08 Dec 2002 (08.12.2002)	60/431,662	US	01 Marc 2004 (01.03.2004)



The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. (41-22) 338.87.40	Authorized officer N. BEN MANSOUR Telephone No. (41-22) 338 8761
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PCT REQUEST

IMM152D.PCT

Original (for SUBMISSION) - printed on 08.12.2003 01:01:48 PM

0	For receiving Office use only	
0-1	International Application No.	
0-2	International Filing Date	
0-3	Name of receiving Office and "PCT International Application"	
0-4	Form - PCT/RO/101 PCT Request	
0-4-1	Prepared using	PCT-EASY Version 2.92 (updated 01.07.2003)
0-5	Petition The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	Receiving Office (specified by the applicant)	United States Patent and Trademark Office (USPTO) (RO/US)
0-7	Applicant's or agent's file reference	IMM152D.PCT
I	Title of invention	METHODS AND SYSTEMS FOR PROVIDING A VIRTUAL TOUCH HAPTIC EFFECT TO HANDHELD COMMUNICATION DEVICES
II	Applicant	
II-1	This person is:	applicant only
II-2	Applicant for	all designated States except US
II-4	Name	IMMERSION CORPORATION
II-5	Address:	801 Fox Lane San Jose, CA 95131 United States of America
II-6	State of nationality	US
II-7	State of residence	US
III-1	Applicant and/or inventor	
III-1-1	This person is:	applicant and inventor
III-1-2	Applicant for	US only
III-1-4	Name (LAST, First)	GRANT, Danny
III-1-5	Address:	6678 Chateaubriand Montreal, Québec H2S 2N7 Canada
III-1-6	State of nationality	CA
III-1-7	State of residence	CA

PCT REQUEST

IMM152D.PCT

Original (for SUBMISSION) - printed on 08.12.2003 01:01:48 PM

III-2	Applicant and/or inventor	
III-2-1	This person is:	applicant and inventor
III-2-2	Applicant for	US only
III-2-4	Name (LAST, First)	EID, Jeffrey
III-2-5	Address:	105 Shadwell Drive Danville, CA 94506 United States of America
III-2-6	State of nationality	US
III-2-7	State of residence	US
III-3	Applicant and/or inventor	
III-3-1	This person is:	applicant and inventor
III-3-2	Applicant for	US only
III-3-4	Name (LAST, First)	ENDO, Shoichi
III-3-5	Address:	20268 Northwest Square Cupertino, CA 95014 United States of America
III-3-6	State of nationality	JP
III-3-7	State of residence	US
IV-1	Agent or common representative; or address for correspondence The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	agent
IV-1-1	Name (LAST, First)	ALEMANNI, John, C.
IV-1-2	Address:	Kilpatrick Stockton LLP 1001 West Fourth St. Winston-Salem, NC 27101 United States of America
IV-1-3	Telephone No.	336-607-7300
IV-1-4	Facsimile No.	336-607-7500
IV-1-5	e-mail	jalemanni@kilpatrickstockton.com
IV-1-5	Agent's registration No.	47,384
IV-2	Additional agent(s)	additional agent(s) with same address as first named agent
IV-2-1	Name(s)	STOJKOVICH, Goran, P. (45,841); WINTERLE, Bret, T. (54,546); GARDNER, Steven (41,772); HARRINGTON, John, M. (25,592)

PCT REQUEST

IMM152D.PCT

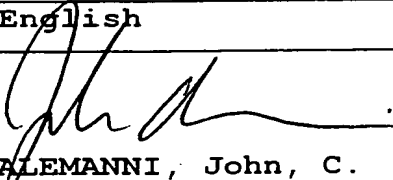
Original (for SUBMISSION) - printed on 08.12.2003 01:01:48 PM

V	Designation of States	
V-1	Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	<p>AP: GH GM KE LS MW MZ SD SL SZ TZ UG ZM ZW and any other State which is a Contracting State of the Harare Protocol and of the PCT</p> <p>EA: AM AZ BY KG KZ MD RU TJ TM and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT</p> <p>EP: AT BE BG CH&LI CY CZ DE DK EE ES FI FR GB GR HU IE IT LU MC NL PT RO SE SI SK TR and any other State which is a Contracting State of the European Patent Convention and of the PCT</p> <p>OA: BF BJ CF CG CI CM GA GN GQ GW ML MR NE SN TD TG and any other State which is a member State of OAPI and a Contracting State of the PCT</p>
V-2	National Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	<p>AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH&LI CN CO CR CU CZ DE DK DM DZ EC EE EG ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NI NO NZ OM PG PH PL PT RO RU SC SD SE SG SK SL SY TJ TM TN TR TT TZ UA UG US UZ VC VN YU ZA ZM ZW</p>
V-5	Precautionary Designation Statement In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit.	
V-6	Exclusion(s) from precautionary designations	NONE
VI-1	Priority claim of earlier national application	
VI-1-1	Filing date	08 December 2002 (08.12.2002)
VI-1-2	Number	60/431,662
VI-1-3	Country	US

PCT REQUEST

IMM152D.PCT

Original (for SUBMISSION) - printed on 08.12.2003 01:01:48 PM

VI-2	Priority document request The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s):	VI-1	
VII-1	International Searching Authority Chosen	United States Patent and Trademark Office (USPTO) (ISA/US)	
VIII	Declarations	Number of declarations	
VIII-1	Declaration as to the identity of the inventor	-	
VIII-2	Declaration as to the applicant's entitlement, as at the international filing date, to apply for and be granted a patent	-	
VIII-3	Declaration as to the applicant's entitlement, as at the international filing date, to claim the priority of the earlier application	-	
VIII-4	Declaration of inventorship (only for the purposes of the designation of the United States of America)	-	
VIII-5	Declaration as to non-prejudicial disclosures or exceptions to lack of novelty	-	
IX	Check list	number of sheets	electronic file(s) attached
IX-1	Request (including declaration sheets)	5	-
IX-2	Description	14	-
IX-3	Claims	4	-
IX-4	Abstract	1	EZABST00.TXT
IX-5	Drawings	9	-
IX-7	TOTAL	33	
	Accompanying items	paper document(s) attached	electronic file(s) attached
IX-8	Fee calculation sheet	✓	-
IX-17	PCT-EASY diskette	-	Diskette
IX-19	Figure of the drawings which should accompany the abstract	1	
IX-20	Language of filing of the international application	English	
X-1	Signature of applicant, agent or common representative		
X-1-1	Name (LAST, First)	ALEMANNI, John, C.	

FOR RECEIVING OFFICE USE ONLY

10-1	Date of actual receipt of the purported international application	
10-2	Drawings:	
10-2-1	Received	
10-2-2	Not received	
10-3	Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application	

PCT REQUEST

IMM152D.PCT

Original (for SUBMISSION) - printed on 08.12.2003 01:01:48 PM

10-4	Date of timely receipt of the required corrections under PCT Article 11(2)	
10-5	International Searching Authority	ISA/US
10-6	Transmittal of search copy delayed until search fee is paid	

FOR INTERNATIONAL BUREAU USE ONLY

11-1	Date of receipt of the record copy by the International Bureau	
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